OVARIAN AND UTERINE MORPHOLOGY AS RELATED TO PITUITARY GONADOTROPHIC POTENCY IN EWES

BY

JAMES ALEXANDER WELCH

B.S., University of Kentucky, 1947

THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN ANIMAL SCIENCE
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OVARIAN AND UTERINE MORPHOLOGY AS RELATED TO PITUITARY GONADOTROPHIC POTENCY IN EWES

Kammlade et al. (In Press) found the total gonadotrophic potency of ewe pituitaries to be higher during anestrus than at any time during the estrual cycle except during proestrus. This finding, along with the observation that the ovaries of anestrus ewes have many follicles with rather large diameters, suggested to the above writers that anestrus is the result of an imbalance in the ratio of FSH and LH being produced by the pituitary. The following studies were made to test the above postulation.

Assay of sheep pituitaries from different stages of the breeding and non-breeding seasons for FSH and LH

Portions of most and all of some of the pituitaries collected for the study reported by Kammlade et al. (In Press) remained and were used in this experiment. Four series of assays were made in an attempt to ascertain the relative amounts of FSH and LH in individual ewe pituitaries collected during anestrus and throughout the estrual cycle. In all assays stilbestrol-inhibited White Leghorn cockerels were used as assay animals (Nalbandov and Baum, 1948). Chickens ranging in age from three to nine weeks were used in the different series. The amount of sheep pituitary powder injected varied from 1 to 48 mg. for the entire injection period which ranged from 5 to 10 days in length. An aqueous suspension of the pituitary powder was injected subcutaneously either two or three times daily, depending upon the assay series.

Of the four assay series only the first showed a response of the end organs (testes and comb) to injected ewe pituitary powder. Unfortunately this series was intended merely to find the amount of pituitary necessary to produce a measurable response and only one sample of pituitary tissue from ewes in anestrus, during heat, and during proestrus was used.

The testes of the cockerels which received pituitary from ewes killed during proestrus were significantly larger than those from cockerels which received pituitary from the ewes killed during heat.

The average weight of the testes from the chicks injected with anestrus pituitary was between the testes weights of the other two groups and not significantly different from either. Microscopical examination of the chick testes did not reveal differences in LH and FSH stimulation among the three pituitary samples studied. The stimulation of the combs by pituitary from ewes killed during heat was significantly less than the stimulation produced by either of the other two pituitary samples. This suggests that ewe pituitary glands are low in LH during heat.

Uterine morphology in relation to the pituitary potency of ewes during anestrus and in the estrual cycle

Ovaries and uteri from the ewes described by Kammlade et al. (In Press) were available for this study. The ovaries of anestrus ewes had been found to have numerous large follicles. By studying the uterine epithelium of these anestrus ewes it was possible to determine whether the follicles were secreting estrogen. At the same time it was possible to see if there was a relationship between pituitary gonadotrophic potency and uterine histology which might help to explain the endocrine control of the breeding season of ewes. Uteri from twelve days of the estrus cycle were compared with anestrus uteri. Anestrus uteri from five ewes having high gonadotrophic potency and from five ewes having low gonadotrophic potency were studied as were uterine biopsies from two ovariectomized ewes.

The following uterine characteristics were measured and compared: (1) height of endometrial epithelium; (2) percentage of endometrium occupied by glands; and (3) percentage of the cross-section area occupied by each the muscularis, the endometrium, and the lumen.

There were no differences between the uteri from anestrus ewes with high pituitary potency and those from anestrus ewes with low pituitary potency. Uteri from cycling ewes had higher epithelia, higher percentages of the mucosa occupied by uterine glands, and larger endometria than uteri from anestrus ewes. Castrate uteri were somewhat, although not always significantly, more atrophic

than anestrus uteri. The presence of a peak in the height of uterine epithelium during the mid-luteal phase (McKenzie and Terrill, 1937) was not found. A decrease in height of uterine epithelium during the second and third days of the estrus cycle as observed by McKenzie and Terrill (1937) was confirmed.

CONCLUSIONS

1. Cockerels from three to nine weeks of age when implanted with 15 or 30 mg. of stilbestrol were not found to be satisfactory assay animals with which to test differences in FSH and LH content of sheep anterior pituitaries in dosages varying from 1 to 48 mg. of pituitary powder.

2. On the basis of a small number of pituitaries assayed there is an indication that the LH content of ewe pituitaries is lower during heat than during proestrus or anestrus.

3. The data on uterine histology support the idea that estrogen secretion is low during anestrus even though many follicles equal in size to those during the estrual cycle are present. This indicates either that LH is not produced or is not secreted in sufficient amounts during anestrus to stimulate estrogen secretion.

4. The apparent discrepancy between the conclusions drawn from the two series of studies can be explained only by assuming that during heat the pituitary gland is low in LH because the hormone has been released for the purpose of exerting its effect on the ovaries.

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VITA

James Alexander Welch was born on May 25, 1924, in Versailles, Kentucky. After graduating from Versailles High School in 1941, he entered the University of Kentucky. In March ,1943, he enlisted in the Army Air Force and served in the American and Asiatic-Pacific Theaters. Upon discharge from the Army in 1946, he re-entered the University of Kentucky and received the degree of Bachelor of Science in Agriculture, with distinction, in August 1947. He began his graduate work there at that time and held a half-time graduate assistantship in Animal Husbandry from September, 1947 through July, 1948. In September, 1948 he entered the Graduate College of the University of Illinois. He held a half-time assistantship in Animal Science from September, 1948 to July, 1952. Since July, 1952 he has been an Assistant Professor of Animal Husbandry at West Virginia University.

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